

# Conversational AI to Shake Up Your Technical and Business Worlds

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## Summary

Enterprise architecture and technology innovation leaders must prepare for conversational AI platforms, applications, chatbots and other virtual agents (which serve as the visible or audible face of conversational AI), and the significant new business opportunities and issues they will usher in.

## Overview

### Key Findings

- Artificial intelligence (AI)-rich, general-purpose platforms lack the applications that enterprises need. The currently available smart machine applications tend to be built on narrow, private platforms.
- Many vendors are speeding to market with new general-purpose, conversational AI platforms that will host a broad range of solutions that are lower cost, lower risk, faster to deploy and easier to manage to address enterprise business needs. Some of these applications will be entirely new, while others will have been migrated from earlier, narrow or private platforms.
- "Conversational AI-first" will supersede "cloud-first, mobile-first" as the most important, high-level imperative for the next 10 years.
- As "tip of the iceberg" phenomena, chatbots, conversational and messaging-based applications can make most technologies (including legacy systems) more usable, transforming opaque tools that we have at our command into trusted, valued subordinates that participate in the conduct of our daily life and business.

### Recommendations

Enterprise architecture and technology innovation leaders must:

- Deploy internally focused conversational applications (built on general-purpose, AI-rich platforms) to target legacy production systems with new integration and user experience layers that are exposed via chatbots and other AI-related capabilities.
- Wrap externally accessible APIs with conversational, AI-based interfaces, making them broadly available for both API and interbot conversational access.
- Use conversational, AI-based capabilities to add face to otherwise faceless algorithms and APIs, and to enhance marketing and ecosystem development. Prepare detailed responses to anticipated push-back/resistance around both management control and costs.

# Analysis

## What You Need to Know

There is a big, disruptive platform paradigm shift coming now.

Conversational AI platforms (CAPs) will be the next big paradigm shift in information technology. CAPs are already in market today, but more are coming. CAPs will likely be the strongest instigator of investments that exploit AI for a decade or more. This encompasses more than chatbots, virtual assistants and messaging-based applications: the emergence of CAP will stimulate significant growth in the exploitation of AI in general.

Most AI-related innovation has been in consumer-grade technologies (see the Consumer Leads section). Messaging-based applications are beginning to be the norm among users, particularly millennials. Uses of voice (both speech-to-text and text-to-speech) have grown significantly since 2Q14 (see Uses of Voice section). The industry is agog, chatting about chatbots.

Most enterprises' key technology initiatives are not exploiting AI (see Enterprises Are Stumped section). Enterprises want and need lower cost, lower risk, faster-to-deploy and easier-to-manage solutions that are all built on a common technical infrastructure. Most valuable AI applications are built on narrow proprietary platforms, while most broad, general-purpose AI platforms lack ready-made valuable AI applications and require buyers in every enterprise to fund the redevelopment of new applications. <sup>1</sup>

Into this breach comes almost every major industry player, including Amazon, Baidu, Google, IBM, Microsoft, Oracle, Salesforce and Tencent. They have either delivered or will deliver their own version of a broadly applicable, conversational, AI-rich, general-purpose platform by YE17, some in support of the supplier's own (preconversational-AI) applications; some generally available for enterprise buyers and third parties to build upon; and most to serve both purposes.

As these broad CAPs emerge, today's providers of AI-related applications that are built on narrow obscure platforms (such as IPsoft's Amelia and x.ai's calendaring agent) will come under market pressure to migrate to one or more of the broad, general-purpose CAPs, be acquired or move into narrower, more specialized markets.

Platform paradigm shifts like these generally occur once a decade (see Platform Paradigms Shift Every Decade section). CAPs will supersede the older focus on "cloud-first, mobile-first" strategies (which previously had superseded the focus on, for instance, e-commerce, all the way back to mainframe systems in the 1960s).

Platform paradigm shifts do not go down easily (see New Platform Paradigm section). They are disruptive: Existing initiatives (and platforms) have planning, budget and executive commitment momentum so it can take years (or sometimes decades) for enterprises to complete their transition to new paradigms.

Since 2011, each of the major industry players has contributed key landmarks which, taken together, describe the key attributes of the coming conversational, AI platforms (see Key

Landmarks section). Five common CAP characteristics are emerging (some are more mature than others). The five include conversational, AI-rich, pervasive, proactive and general-purpose platform (see Five Key Aspects of the New Platform Paradigm section). Those five key aspects get expressed in a new CAP abstract system model, which consists of three logical layers: a smart user experience layer (conversational UX and bot controls), an application layer (bots, apps and other applications) and a general-purpose layer with AI and other services, including interaction the Internet of Things (IoT) and systems of record (see Abstract System Model section).

Not all CAPs will come from the major industry players (see Platform Variations section). Other competitors include [Api.ai](#) (now acquired by Google <sup>2</sup>), [HipChat](#), [Hubot](#), [Kore](#), [MindMeld](#), [Openstream](#) and [Slack](#).

This research makes a series of key predictions, with commentary, for both the supply side and the demand side, covering the period from 2017 through 2022. We open the Forward-Looking Perspective section with a short discussion of some of the risks incumbent in making predictions. These predictions provide a tapestry of detailed assumptions that enterprises should take into account in their planning:

- CAP supply will exceed demand. CAP demand will build more slowly.
- Enterprise software products will promote conversational AI capabilities that may just barely qualify as a minimum viable product. <sup>3</sup>
- AI adoption will slowly rise and enterprises will continue to be primarily driven by application value (and value provided by third-party service providers).
- In five years, "conversational-AI-first" will be broadly accepted as a dominant theme (even if not yet broadly adopted).
- By 2022, enterprises will come to (finally) seek CAP rationalization; that is, a reduction in the number of conversational AI platforms in use. Standardization too soon can be more injurious than a failure to standardize.

The move toward CAPs has many implications (see Impacts and Recommendations section). We examine how conversational technology will change our personal relationship with technology and how we do business on the internet, and what enterprises should do about these changes (some of which can be also found in the Recommendations section in the summary).

## Reference

There are five main reference sections within this note:

- The Background section provides *context* for the changes we are predicting.
- The New Platform section looks at the historical pattern of paradigm shifts, the in-market developments that suggest a new paradigm shift, suspected key properties of the new platform and early indicators for our core prediction that a new platform paradigm shift is coming.
- The Forward-Looking Perspective section identifies some of the risks that are particularly salient in this transition. It also contains a series of predictions covering the time period from 2017 to 2022. We are weaving a story with these predictions and provide interprediction commentary to help the reader understand some of the assumptions behind the predictions.

- The Impacts and Recommendations section exposes some of the biggest impacts our clients should pay attention to, along with guidance on what to do next in light of those impacts.
- The Evidence section is a large set of endnotes that define a broad range of terms, cite numerous information sources and help the reader dig deeper where they want.

## **Background**

We have been waiting for artificial intelligence to make a real palpable difference since the 1956 Dartmouth Summer Conference on AI. We recently marveled at the great breakthroughs that researchers made with deep neural networks starting near the beginning of this decade (see ["Smart Machines See Major Breakthroughs After Decades of Failure"](#)).<sup>4</sup> We opined that we were entering the age of smart machines, an era to take us through most of the rest of the century.

Progress has been encouraging but slow. We've seen great advances in image feature classification, speech-to-text, language translation and facial recognition. (This list of product categories does not do justice to the great diversity and progress that has been accomplished — mostly outside the mainstream of enterprise IT activity.)

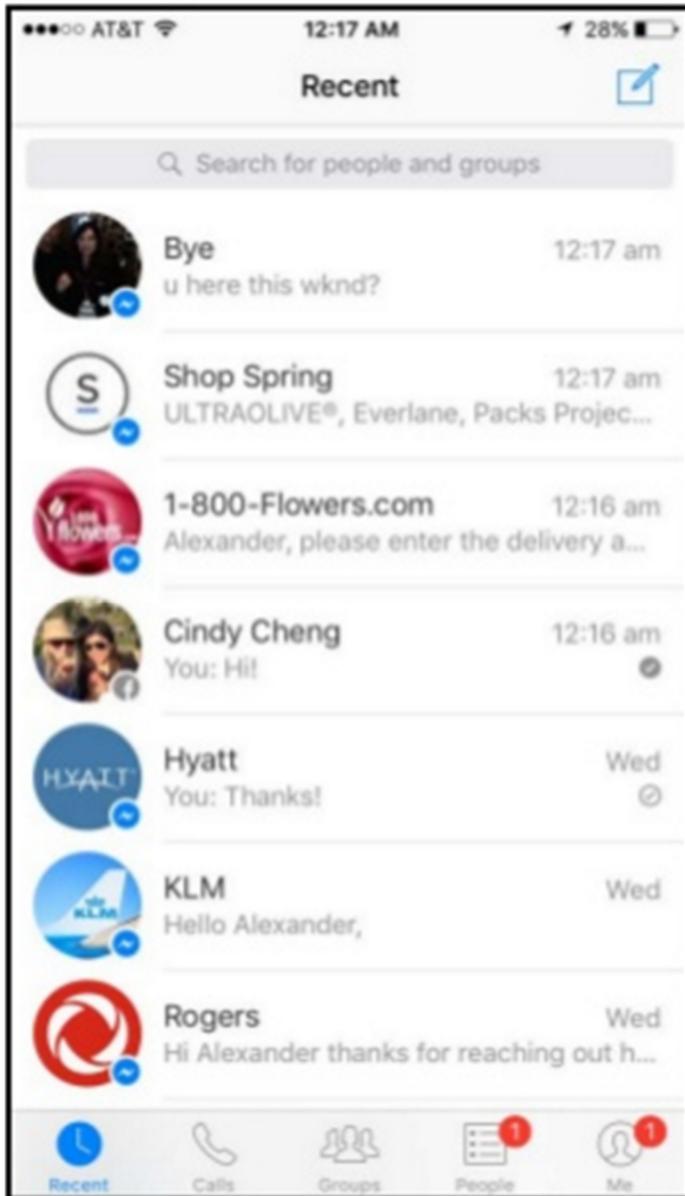
## **Consumers Lead**

Most innovation has only been visible to those individuals using "consumer-grade technology."

Some of us marveled at the automatic proactive recommendations that tools such as Google Now just slipped into our phones, tablets and email.

Messaging-based applications are becoming the "new mobile home page," particularly for millennials. Consumers are now paving a path that includes the following hallmarks: interbot messaging, speech-to-text and text-to-speech, limited dialogue services and chatbots superseding apps. For some consumers, their Facebook Messenger inbox has come to replace their smartphone home screen, as illustrated in Figure 1.

## **Figure 1. Facebook Messenger Inbox**



["Internet Trends 2016 — Code](#)

[Conference \(Page 110\)."](#)

Source: KPCB

The use of messaging-based applications has been exploding and some businesses are benefiting. For example, Rogers Communications set up a customer service line on Facebook Messenger. The company experienced a 65% increase in partner channel customer satisfaction metrics, and a 65% decrease in customer complaints between August 2015 and January 2016 compared to the previous six months prior to the use of Messenger (and down 50% over the past two and a half years).<sup>5</sup>

#### Uses of Voice

Use of voice usage with applications is growing as its accuracy substantially improves. Indeed, 20% of Google searches on Android in the U.S. are now done by voice and 25% of Cortana searches on the Windows taskbar are also done by voice. Baidu reports a fourfold increase in calls to their speech-to-text APIs and a 26-fold increase in calls for text-to-speech

services since 2Q14. Sixty-five percent of smartphone owners already use voice assistants on their phone. <sup>6</sup>

### **Other Uses**

There has been excitement around the potential of virtual customer assistants (VCAs) to delight customers while cutting call center costs. <sup>7, 8</sup> Most leading organizations that Gartner has talked to have piloted IBM Watson, played with Google TensorFlow or built an application or two on Azure Machine Learning (or all three). In the last three years, Gartner has written about hundreds of examples across a broad range of industries. <sup>9</sup> But, for the average Gartner client, there has been little real motivation to throw the doors open and tell staff to stop what they're doing, that they have to get their arms around messaging-based applications and voice use with applications; they have been almost exclusively a consumer experience, not an enterprise employee experience.

### **Enterprises Are Stumped**

On the one hand, we hear "Where's the killer AI app?" and moments later, someone else cries "What's the right AI platform to standardize on?" with little recognition of the irony of implying two divergent approaches, apps or platforms:

- Existing AI platforms have few finished, off-the-shelf apps. <sup>10</sup>
- The apps that are getting traction are seemingly not built on "leading platforms."

As always, there are exceptions to all these generalizations, but this is the overall situation.

The gap between platforms and apps will be filled by chatbots that participate in people's daily lives. <sup>11</sup> Viable, visible, valuable chatbots will be the most obvious, observable evidence of change, but chatbots are only the lips and ears, or eyes, of the underlying robust, smart (AI-rich) platforms on which conversational systems will be built. And those conversational systems will work with other production systems too. So the story is much bigger than chatbots. <sup>12</sup>

### **Confusion Will Abate**

Conversational, AI-rich platforms (CAP) are not "the promised land" of smart machines, but they're enough to accelerate the growth of AI-related markets. We expect that, as a result, almost every IT organization, developer, service delivery person, marketing executive and salesperson will invest the time to learn more about the technical capabilities and potential business impact in order to treat the reality of deep learning and natural-language processing (NLP) as something substantial, and worth further investigation and potential investment.

New chatbot-centered applications and platforms will fire up the AI revolution inside enterprise IT in particular, and in the world in general.

Disruptive platform paradigm shifts create opportunity. There is already ample evidence showing that almost every major software vendor (we count more than a dozen) is building a broadly usable, conversational, AI-rich platform. Indeed, betas abound. There are also more smaller technology firms, service providers and entrepreneurs in, or almost in, market with conversational, chatbot-centered, AI-rich platforms of their own.

With CAP in market, there will be a flood of new AI-enhanced applications from a broad range of providers. As CAPs establish themselves, there will be pressure on AI specialty application providers to move from their narrow, opaque platforms to more open, general-purpose ones.

## **New Platform Paradigm**

It feels like it was a lifetime ago that we were moving toward e-commerce and web-based applications (indeed, it was almost 20 years ago!). We learned only a decade ago that "mobile first, cloud first" was the new way to go.

### **Platform Paradigms Shift Every Decade**

Almost like clockwork, in every decade a new platform paradigm emerges that works its way through the industry (see Table 1).

**Table 1.** Decadal Platform Paradigm Shifts

<b>New Platform Paradigm</b>	<b>Period</b>
Mainframe systems	1960s
Minicomputers	1970s
PCs and file sharing LANs	1980s
Client/server and GUIs	1990s
Internet and web applications	Late 1990s to 2007
Mobile and cloud	2007 onward

Source: Gartner (September 2016)

#### **The Enterprise Path Forward Through Paradigm Shifts**

The technology transition from one paradigm to another is generally disruptive, costly, unavoidable, eventually complete and, in retrospect, definitely worth it. But, particularly at the start, each successive paradigm typically:

- Is ignored or disdained by most IT leaders at first
- Overpromises and underdelivers at introduction
- Challenges its predecessor for market dominance
- Requires significant change among providers, distributors, buyers, users and others
- Creates business disruptions in the industry
- Eventually becomes a well-accepted part of the fabric of the industry as it diffuses across large parts of the overall market <sup>13</sup>
- Becomes prey for the next great wave of disruptive innovation

Investors have built (and sometimes lost) fortunes betting on potential emerging leaders in new segments that create or cluster around the new paradigms. Consultants and academics have built careers on dealing with these types of disruptions. <sup>14</sup>

#### **Current Developments Point to the Future**

Platform paradigms emerge "unconsciously" (as per the economic theory of the invisible hand of the marketplace) from the activities of many industry participants, including buyers. <sup>15</sup>The acts of any one participant can influence the acts of another, and so on, until the industry finds itself in a new place.

To try to identify the destination, we look for what appear to us to be landmark product technology developments, ones that illustrate an increasingly clearer pattern for what we believe will be the next decadal platform paradigm shift. (There are, of course, risks to this approach to predicting the future. We discuss some of the possible failure modes that could invalidate our conclusions about conversational, AI-rich, general-purpose platforms in the Prediction Risks section.)

#### Key Landmarks

All of the following landmarks (sorted in order of initial appearance) are actively evolving right now:

Tencent's WeChat user-facing bot represents a landmark (2011) in the emergence of bot-based, conversational (natural-language dialogue) systems, with the user talking to a single bot which invokes other bots or apps on behalf of the user and returns results to the user on the screen of their device. <sup>16</sup>

IBM Watson began commercial life (2014) as an AI-rich framework that was populated with a range of natural-language processing capabilities and numerous frameworks with which to apply those capabilities to broad use cases (such as the "Watson Engagement Advisor"). It subsequently evolved into a very rich, broad array of AI services. Watson was the first broad AI system that enterprises worldwide began to explore and invest in.

Amazon's Alexa Skills Kits (2015) made it possible for third parties to add features to what has become a zeitgeist-changing new paradigm — always-available, voice-based user interfaces. <sup>17, 18</sup> There are now over 1,500 third-party Alexa skills available.

Microsoft followed in 2016 with its Cortana Intelligence Suite, an AI-rich framework that is populated with a range of natural-language processing and deep learning capabilities, provisioned on Microsoft Azure and bound together by a single landmark avatar identity, Cortana.

Facebook Messenger is a landmark not just because of the size of the user base exposed to its chatbot services, but because it was arguably the first platform to provide services from more than 10,000 different chatbots. <sup>19</sup>

Google leads the industry with its inclusion of AI-based features in its various applications, while Salesforce has acquired nine different AI firms whose technology Gartner believes will be integrated into Force (Salesforce's platform), expanding it for use by both customers and Salesforce.

Google, Microsoft and IBM have all introduced a variety of conversation-related beta services within the last three months — and they're not unique in that regard.

Table 2 summarizes the selected contributions made by the cited vendors.

**Table 2.** Selected Supplier Investments

<b>Who</b>	<b>What</b>	<b>Disruptive Component(s)</b>	<b>When</b>
Tencent	WeChat	User facing, <sup>1</sup> bot-ecosystem, <sup>2</sup> voice in; screen out, transaction automation	2011
IBM	Watson	Generally applicable platform (designed to support many different uses), largest array of AI services, <sup>3</sup> extensive business services and frameworks, conversational services now available	2014
Amazon	Alexa Skills Kit	User-facing, chatbot ecosystem, rich AI services, voice in, voice out, transaction automation, nonmobile, AI services (Amazon Web Services)	2015
Microsoft	Cortana Intelligence Suite	Generally applicable platform, user-facing (leverages Cortana's broad availability), chatbot ecosystem, rich AI services, AI services (Azure), chatbot tools in beta	2016
Facebook	Messenger	User-facing, chatbot ecosystem, rich natural-language processing	2016
Google	SyntaxNet, TensorFlow, other <sup>4</sup>	Generally applicable platform, user-facing, AI services (Google Cloud Platform), open-source libraries, richer AI embedded in applications (and Assistant), announced Google Home (Alexa competitor) for 2H16 availability	2016
Salesforce	Force Platform extensions	Einstein, AI services embedded in Force platform. <sup>5</sup> Salesforce CEO: Salesforce to become an "AI-first" company. <sup>6</sup>	2016

<sup>1</sup> "User—facing" refers to chatbots that interact with the user and act on their behalf by invoking other entities (bots, apps, applications and other services.) Chatbots may (but do not always) exhibit a specific persona and employ an avatar.

<sup>2</sup> "Bot ecosystem" refers to organized efforts by the supplier to encourage other bot providers to specifically integrate with bots that are central to the supplier's bot strategy.

<sup>3</sup> AI services include broad ranges of machine learning services (particularly deep learning and variants) and natural-language processing (NLP) services, as well as related, underlying services such as graph database traversal and inference services. For sample services lists, see [Watson services on Bluemix](#) and Cortana Intelligence Services on Azure under [Machine Learning and Analytics and Intelligence](#). All are "narrow purpose." (There are no general-purpose intelligence technologies.)

<sup>4</sup> SyntaxNet appeared in 2016 and TensorFlow in 2015. SyntaxNet is built on TensorFlow and provides a growing collection of Google NLP services.

<sup>5</sup> Salesforce AI acquisitions. 2015: MinHash (AILA) and TempoAI, 2016: MetaMind, Implitis Insights, PredictionIO and BeyondCore.

<sup>6</sup> ["Salesforce CEO Marc Benioff Just Made a Bold Prediction About the Future of Tech."](#) Business Insider Australia.

Source: Gartner (September 2016)

Using the data in Table 2, as well as the decadal paradigm disruption pattern illustrated in Table 1, we assemble the key elements of the new paradigm in the next section.

### **Five Key Aspects of the New Platform Paradigm**

The new paradigm: a conversational, AI-rich, pervasive, proactive, general-purpose platform.

#### Conversational

**Description:** Moves away from fixed commands for communications between people, bots, agents, assistants, applications and other services.

**Rationale:** Make machines smarter by designing them to ask people for help, and they make people more capable of handling novel tasks without specialized training (see ["Smart Agents Will Drive the Switch From Technology-Literate People, to People-Literate Technology"](#)).

**Comment and Discussion:** NLP will come to rapidly replace rule-based synonym and phrase substitution approaches. Dynamic natural-language ontologies or knowledge graphs at multiple levels of specificity will be needed to support NLP capabilities such as disambiguation, concept identification and relationship extraction.

Tim O'Reilly's word of caution is important here:

What Alexa has shown us that rather than trying to boil the ocean with AI and conversational interfaces, what we need to do is to apply human design intelligence, break down the conversation into smaller domains where you can deliver satisfying results, and within those domains, spend a lot of time thinking through the "fit and finish" so that interfaces are intuitive, interactions are complete, and that what most people try to do "just works."  
["What Would Alexa Do?"](#) LinkedIn.

#### AI-Rich

**Description:** Offers a broad array of narrow AI services (also known as smart machine or cognitive computing services).

**Rationale:** Essential to the conversational, pervasive, contextually sensitive and proactive aspects of the paradigm.

**Comment and Discussion:** Natural-language processing and deep machine learning are central to the development of smart machines. Scores of narrow intelligence services are needed to populate an AI-rich environment, including, for example, sentiment analysis, personality profiling, concept-relationship extraction and other methods for inferring intent from content and context.

#### Pervasive

**Description:** Persists across modalities, locations, devices and contexts while sensitive to the implications of changing context.

**Rationale:** Context is key to pervasively and intelligently serving user needs.

**Comment and Description:** It's important to deliver an ambient UX that blends physical and virtual environments in a continuous experience to preserve continuity across a mesh of devices (see ["Top 10 Strategic Technology Trends for 2016: Ambient User Experience"](#)). Continuity requires services that are no longer tied to singular modes (speech, handwriting

and keyboarding), devices (including voice-only, personal fitness wearable, dress watch, tablet or large-scale screen), times and places.

Pervasiveness may be viewed as pernicious and threatening if it is not also contextually sensitive.

#### Proactive

**Description:** Offers nondisruptive simplification for the user. Conversational technologies make machines smarter and make humans more successful in relatively novel situations. However, they can impede productivity in routines that are well known to the user, so the technology needs to observe what people do and offer simplification. Most of today's technologies are very weak on proactivity.

**Rationale:** Detecting patterns in user behavior, as well as offering unsolicited suggestions (shortcuts) based on the user's behavior to automatically handle multistep sequences, is essential to user productivity for less novel situations.

**Comment and Discussion:** Shortcuts are often suggestions from the chatbot to the user, but they can also be suggestions (or requests) from the user to the chatbot.

Shortcuts can create their own complications, defeating the simplification objective, if there are too many of them or the user has been away from the technology for too long.

Unobtrusive simplification works in some cases (such as Google Information Cards), but there are likely too few successful patterns to believe that proactivity will emerge painlessly in this new paradigm. If there isn't a high degree of precision in identifying intent, that will actively discourage usage.

#### General-Purpose Platform

**Description:** Consists of all the conversational, AI-rich, pervasive and proactive services, along with Internet of Things and systems of record access in a coherent collection (it does not need to be a single package).

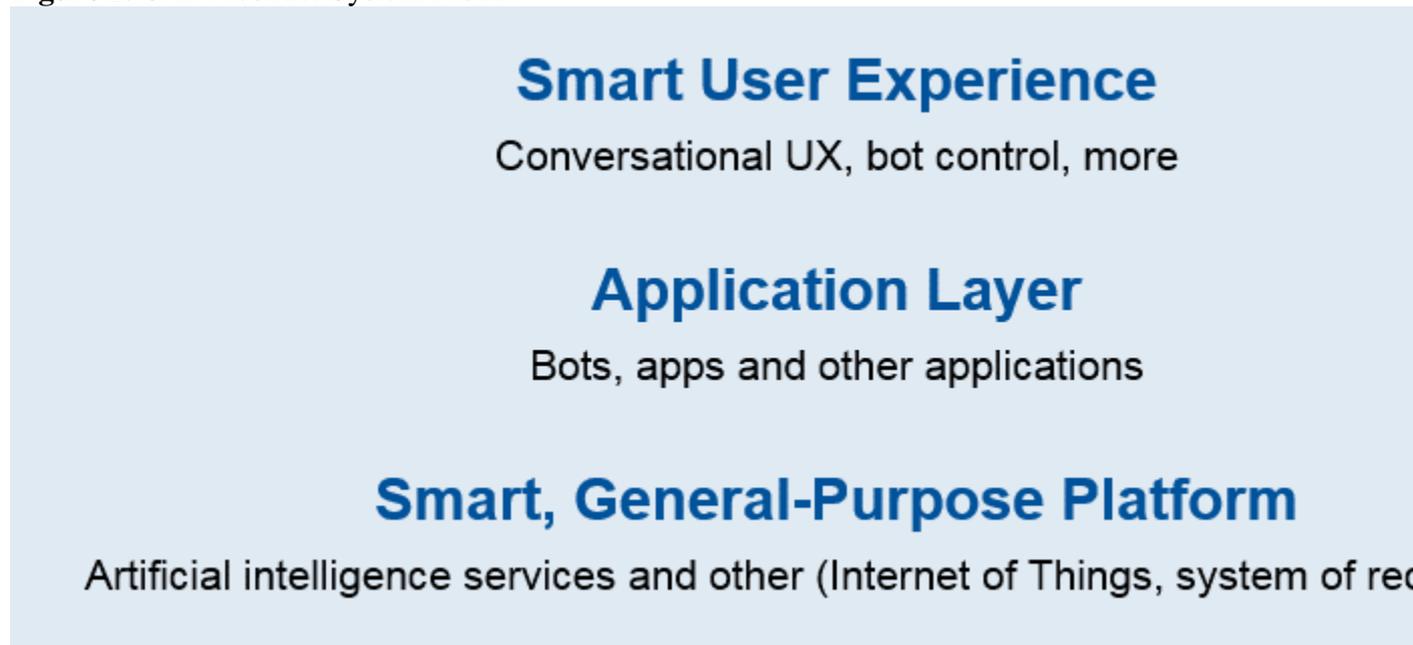
**Rationale:** Platforms reduce complexity and improve utilization. IT professionals tend to prefer a single, fully populated platform, while technology providers and investors prefer multifaceted markets to profit from the broadest ecosystem.

**Comment and Discussion:** There will be many platforms; some broad, others narrow. Some (which we refer to as narrow and opaque) will provide access to their platforms only through their applications, while others will be more aggressively open to use or extension by anyone. Most will give preferential treatment to their own services, raising the costs and complexity of projects using services from multiple platforms. Through 2021, applications will matter more than platforms. Thereafter, IT organizations will prioritize platform unification (like portal unification and database unification before them).

#### Abstract System Model

The five key aspects of this new paradigm might best be thought of as a three-layer model (as shown in Figure 2) consisting of a smart user experience model, sitting on top of an application layer, running on top of a smart, general-purpose platform layer.

**Figure 2.** CAP Abstract System Model



Source: Gartner (September 2016)

#### Smart User Experience

This is a smart conversational environment in which the user and various chatbots interact. In some scenarios, there is one chatbot (such as WeChat), a master chatbot that interacts with the user. We expect that, in most cases, there will be many chatbots that the user interacts with (and that interact with the user). Chatbots determine what entities in the application layer are needed to address the user's needs and hand off requests, passing back results. Chatbots recognize and suggest best practices based on user interactions, and may also learn from each user how they work, what they do, and the context within which it all happens in order to anticipate the users' needs and make suggestions to simplify how things get done.

In the graphical user interface world, the user had to learn the interface, but in a conversational interface, the roles are switched: it's the interface that is learning the user. Our ability to personalize experiences is already quite advanced, but the principles of interaction on a screen relies on the user's motor and visual memory and, therefore, changing things around based on user intent doesn't necessarily optimize the user experience because it will break the first-order principles of interaction design. Conversational interfaces do not have this restriction because the dialogue is relying on more natural ways of communication — involving fewer abstraction levels.

#### Application Layer

This layer consists of bots, apps, agents and other applications. The initial bot invokes services from these entities that, in turn, may invoke other services from other entities, and may be able to take advantage of the services layer in the platform(s) beneath. The application layer may be able to span logical platforms.

#### Smart, General-Purpose Platform

This collection of services includes AI, IoT, system of record, ambient experience, device mesh, management and other services.

Links between CAP and the IoT are important because both benefit from facilitation by the other and both are, or will be, a subject of new initiatives within enterprises.

The IoT platform provides the underlying infrastructure that facilitates communication and action among users, objects and applications. IoT benefits from CAP in the following ways:

- **A more natural UX:** The conversational nature of CAPs obviates the need for the user to recall specific commands, syntax or parameters for remote control IoT use cases.
- **Ease of communication:** By its nature, an IoT system can consist of a myriad of protocols up and down the stack (see ["IoT Communications Architecture Demystified"](#)). The NLP capabilities of CAPs provide an abstraction that can potentially ease the cross-protocol communication issues.
- **A learning system:** The adjacent AI platform capabilities provide a mechanism by which the data from individual objects can be learned, over time, in a collective manner. This will provide more value to the overall IoT system.

Conversely, CAP also benefits from IoT in the following ways:

- **Enhanced pervasiveness:** IoT allows CAP to reach out to, not only apps, but also individual objects and systems (and their associated data and analytics).
- **Smarter proactiveness:** IoT provides data from more sources (input), as well as potential actions that affect the physical world (output). This allows for a richer CAP experience for the user, with more opportunities for automation and efficiency.

Technology providers are already starting to experiment with the symbiotic relationship between CAP and IoT. In its August 2016 update, Microsoft's Skype division added an IFTTT (If this, then that) bot to its bot directory that can interact with more than 50 different types of IoT devices, ranging from cars to wearables to connected home devices.

### Platform Variations

Not all CAPs will come from major vendors such as those listed in Table 2. Other competitors include Api.ai, HipChat, Hubot, Kore, MindMeld, Openstream and Slack. As illustrations, consider Kore and Openstream: Both have announced enterprise-focused bot platforms that align with many of the characteristics discussed in the Five Key Aspects of the New Platform Paradigm section.

Kore has introduced "Kora," what it describes as "a sophisticated universal bot or virtual personal assistant (VPA) for work." According to Kore,

Kora already can converse with the most popular and critical enterprise applications — from Salesforce and SAP ERP to Microsoft CRM, Concur, Success Factors, Jira, ZenDesk, Trello, Box and more. Unlike bots that perform a single task such as scheduling meetings, Kora can do more than 800 tasks in over 130 different systems. She can take action, pull information or receive notifications. Kora is also NLP-enabled, making her smarter, more powerful and more helpful than any other bot on the market for the modern workforce.

["Kore Inc. Launches The First Enterprise-Grade Bots Platform-as-a-Service, Bot Store and Universal Bot for Any Employee."](#) Kore.

Openstream describes its enterprise virtual assistant (EVA) as:

A Virtual Assistant that gets to know you, your device, your location, your preferences & priorities, and intelligently adapts itself to deliver an "in-the-moment" personalized mobile experience... EVA monitors all your enterprise applications and content sources and helps to quickly complete your tasks.

["EVA — your Enterprise Virtual Assistant."](#) Openstream.

Some suppliers' CAPs will be narrower, particularly at the smart, general-purpose platform level. Their platforms may also be opaque, hidden or closed, particularly when the provider is application-focused (rather than platform-focused). Although strong, to some extent, on their own merits, the two examples below rely on hidden and incomplete conversational platform capabilities — they're not general-purpose platforms, which disqualify them from being considered full conversational, AI-rich platforms in accordance with the Five Key Aspects section. They're better thought of as useful, specialized predecessors to the broader movement toward CAPs that we foresee.

- IPsoft's Amelia meets many of the characteristics of CAP, but it hides its underlying services infrastructure and is focused on a small proportion of the many expected product categories for which CAPs will be used. (Amelia is a strong player in the virtual customer assistant product category.)
- x.ai's meeting scheduling chatbot, Amy (also known as Andrew) Ingram:
  - Communicates with people via email (enabling it to be pervasive; that is, operate almost anywhere)
  - Contains a relatively narrow set of AI services
  - Does not provide direct access to its underlying platform services — its platform isn't a general-purpose platform.

## **Forward-Looking Perspective**

### **Prediction Risks**

Predictions carry risk, many of which are self-evident. The probability of success of any prediction depends on prior predictions coming true. Failures multiply. In time, cascading assumptions become less likely as the analysis moves out.

Gartner is making assumptions about progress in machine learning and natural-language processing that are not simple extrapolations of current knowns.

There are many fantasies about AI that people perpetuate, beginning with the assumption that we can build an artificial intelligence. We can't (see ["How to Define and Use Smart Machine Terms Effectively"](#)). If too many senior executives buy into anthropomorphic assumptions about conversational interfaces (for example, "They are indistinguishable from people," "They can learn through observation everything they need to know to replace all the people in your call center") then too many projects will fail and be shut down and AI could re-enter the state known as "AI winter," sapping the investment needed for the technology to continue to rapidly improve. [20](#), [21](#)

The relevant technical skills are scarce. Many of the underlying technologies are still "research"-grade rather than "engineered," meaning that well-defined and characterized methods may not yet exist. Instead, experts may need to experiment and fiddle with various aspects to get the technology to work for each particular use case, and there is no well-defined methodology to follow. Further, it may not be possible to "fiddle" enough to meet use-case requirements (and there may not be enough suitable data with which to train the system).

Nontechnical factors are risks as well. Social, cultural, legal, regulatory and workforce issues must be considered and could, at least in certain areas, slow or stop the progress of conversational, AI-rich applications, systems and platforms. Concerns regarding personal privacy, enterprise security and balkanization of the internet could undermine our assumptions.

Nonetheless, Gartner offers a set of predictions, interspersed with informative comments, to lay out the most likely progression of CAPs between 2017 and 2022.

### **Predictions**

#### **Supply Side**

*By YE17, there will be at least 25 CAPs available and heavily promoted, 10 from major industry players and 15 from other vendors.*

- There is enough activity documented in Table 2 (as well as activity among smaller firms) to make this prediction likely to be correct.

#### **Enterprise Adoption and Use**

*By 2018, at least 50% of the newest versions of enterprise software products will include some CAP-based capabilities.*

- Most of these features will be there for show to help bolster the vendor's innovation credibility, and give salespeople something to use to get the attention of customers and prospects.
- Many of these innovation symbols will just barely qualify as minimum viable products. Fewer than 5% of customers will actually make use of these features within the first year in which the new enterprise applications versions containing these features are installed.

*By 2020, at least 80% of new enterprise application releases will make reasonably strong use of chatbots, underpinned by the other properties described in this note for conversational, AI-rich applications.*

- Adoption in enterprises will increase. Expect more than half of all enterprises that have installed new versions of enterprise applications with these features to experiment with these features within the first year postinstallation. Production use will climb to 20% in 2020.

- Fewer than 25% of those exploiting these new capabilities will invest in heavily customized or custom-made integrations between their legacy systems and the AI-related service from their CAPs.

## **Revenue Split**

Platforms versus applications versus services

*Through 2021, less than 5% of enterprise spend on conversational, AI-rich applications will directly go to CAPs. Fifty percent will go to commercial business applications that exploit CAP(s), while the remainder will go to externally provided services.*

## **New Priorities**

*By 2021, "conversational AI-first" will be adopted by the majority of enterprise IT organizations as the most important new platform paradigm. The "conversational AI-first" meme will supersede "cloud first, mobile first" by 2021.*

- This new platform paradigm marks the beginning of the "postapp era." Instead of scores or hundreds of apps (of which individuals typically depend on 4-to-6 in any given day), we expect people to rely on multiple agents that will learn their needs and preferences and do their bidding, providing proactive, context-sensitive support almost everywhere. These agents will be typically thought of as chatbots, and chatbot-based systems will populate many areas that are emerging today in the area of smart machines. Virtual personal assistants, virtual customer assistants and cognitive expert advisors will be recreated using chatbot technologies that are built on underlying conversational, AI-rich platforms.

## **Secondary Implication**

*By 2022, the majority of enterprise IT planners will seek ways to reduce the number of different CAI service providers they use.*

- In the short run, applications with conversational, proactive and pervasive properties will be more important than platforms (but will be dependent on a rich array of AI services).
- There will be many hybrid conversational AI platforms as well. CAP will not be a one-provider solution for most enterprises; CAP providers will build their own custom (hybrid) CAPs, consisting of their own unique services, as well as other services from other providers. For example, there will be chatbot platform providers that rely on Google or Amazon NLP capabilities as back ends that power their platform. Some chatbots providers will no doubt leverage IBM's tone and sentiment analysis services to add capabilities to their platform.
- In the long run, IT leaders will seek platform unification in the same way they seek (or sought) portal and database unification, resulting in reductions in the number of CAPs in use — but they will not always succeed in getting down to only one.
- In the long run, self-assembling platforms may emerge, exploiting the conversational capabilities of most providers' components.

## **Impacts and Recommendations**

Broadly speaking, CAI will impact our personal relationship with technology (at home and at work), as well as how individuals and enterprises do business on the internet.

Chatbots provide a visible (and/or audible) instantiation on application logic built and take advantage of the underlying (AI-rich) technology platforms. That face will have a personality — a persona. Some chatbots will adopt a bland personality, others, a cheeky one, and all across a spectrum.

### **Our Personal Relationship With Technology**

With conversational technology, people will express in natural language (written or spoken) what they need, respond to the chatbot's questions to clarify their intent or train it on what they need. They will also consider suggestions it makes proactively.

Over time, this has the potential to change the relationship between people and technology.

People will no longer simply issue well-memorized (or obvious, on-screen) commands (using technology as tool). With natural-language dialogues, technology will be much more than a tool: it becomes a subordinate. As a result, we will be more emotionally engaged. When that happens, we will project qualities into the technology that might not be there. We'll have cases where technology will be considered "cruel," "rude," "stupid" or "insubordinate" by its users. Since conversations are nondeterministic, users will create a rationale for the responses they get — often adding elements that might not be present. Designing personalities to be friendly and nonthreatening can mitigate unintended projections by the users.

Trust and context are critical to the changing relationship between us and our technology. Trust is not an automatic attribute. Trust needs to be earned and will build slowly. Over time, we will delegate more authority to technology to act automatically on our behalf. For that to happen, particularly as the technology becomes pervasive, context sensitivity will be critical for providing the right value in the right place and at the right time.

We will grow dependent on our newfound subordinate peers (chatbots) to perform many of the things we do for ourselves (or wish we could do for ourselves). Our technology dependencies are already growing. How often do you do long division problems by hand? Why are we no longer teaching cursive in schools? Do you rely on Google Search for cognitive offloading? In a recent research project, Storm, Stone and Benjamin wrote that:

"The ways in which people learn, remember, and solve problems have all been impacted by the Internet. The present research explored how people become primed to use the Internet as a form of cognitive offloading. ... The present study provides an example of how using the Internet as an information source potentiates the future use of the Internet as an information source, but it stands to reason that such an effect is likely to occur in many other contexts as well."

["Using the Internet to Access Information Inflates Future Use of the Internet to Access Other Information."](#) Taylor & Francis Online.

Offloading is an important concept. We will offload more and more, particularly to chatbots that make useful suggestions, which is a key characteristic of chatbots that are built using AI-rich underlying platforms.

We also know that people form bonds or emotional attachments with technologies, particularly as they become dependent on that technology. For instance, U.S. soldiers in Iraq formed strong bonds with the iRobot PakBots that destroyed improvised explosive devices for them, holding funerals for some of them when they were destroyed. <sup>22</sup>

Chatbots will become active, trusted participants in our lives, both at home and at work. Not all of them, of course — we'll ignore some, delete others and perhaps bond with a few, never trusting one with all of our most important, delegable responsibilities.

*Recommendation:*

Replace dread with delight. Evaluate using chatbots that are built on conversational, AI-rich platforms as a new integration and user experience layer to simplify and speed up user interactions with legacy production applications and systems.

**Doing Business on the Internet**

Conversational, AI-rich technologies will change how enterprises do business on the internet. In the long run, chatbots (and platform underpinnings) will replace most mobile apps, as well as web applications. The transition will start slowly and then accelerate.

**Marketing**

Chatbots, the face of conversational, AI applications, will have a persona, whether it presents an avatar or not.

CAP providers will likely offer a broad range of basic identities (or variations on a single identity) for chatbots that are part of (or derived from) their platforms. Familial characteristics will be shared across personas. All of this will help bolster the provider's image in the marketplace. We expect, for example, that Microsoft will want conversational, AI-rich applications built on their Cortana Intelligence Suite to funnel interactions and control through its Cortana persona(s). Similarly, other providers will bolster the unique personas of their own offerings.

Is it better to adopt the provider's personas? There will likely be incremental marketing benefits associated with using the supplier-provided personas (for example, participating in the provider's online storefront, promotion by the supplier and synergies with other chatbots on offer from other enterprises). But there are also disadvantages such as brand value dilution.

The stronger an enterprise's identity in its target market, the stronger the argument in favor of ignoring the supplier's generous offer to use its chatbot's or avatar's personas. A key factor in deciding whether a digital business strategy requires the enterprise to avoid being too closely tied to its supplier's identity is the enterprise's application platform strategy. An enterprise that depends on building a multidimensional ecosystem around its application platform needs stronger control over the personas presented by its offerings.

**Control and Costs**

In the formative stages of this new platform paradigm, there are many unknowns.

For example:

- Control Issues. We don't know what controls suppliers might put on building applications on their conversational, AI-rich platforms. We doubt that general-purpose platforms will succeed with a "walled garden" approach.<sup>23</sup> However, applications built on anyone else's platform exist under at least short-term control of the platform supplier.
- Costs are unknown and fee structures are not consistent across the examples in Table 2.

*Recommendations:*

- Examine the digital business impacts of conversational, AI rich platforms. Use chatbots to add face to faceless APIs and algorithms. Focus on marketing issues (such as brand identity and ecosystem strategy).
- Beware of the many unknowns since this platform paradigm is just beginning to emerge. Get started with small, internal and external projects. Internally, replace dread with delight by exploiting proactive chatbots to make users more effective and prouder of their work. Externally, where appropriate, wrap externally accessible APIs with conversational, AI-based chatbots.

## Gartner Recommended Reading

["Smart Agents Will Drive the Switch From Technology-Literate People, to People-Literate Technology"](#)

Additional Recommendations Outside Your Current Gartner Subscriptions

["Market Insight: Conversational Commerce — Hype or Reality?"](#)

["Maverick\\* Research: Machines Will Talk to Each Other in English"](#)

["How to Define and Use Smart Machine Terms Effectively"](#)

## Evidence

<sup>1</sup> An opaque platform is not transparent. It does not expose its internal services for use by others. Its APIs are hidden. By way of contrast, general-purpose platforms are transparent. They do expose their internal services for use by others. Their APIs are documented and available for use.

<sup>2</sup> ["Making Conversational Interfaces Easier to Build."](#) Google Developers Blog.

<sup>3</sup> See ["Minimum Viable Product."](#) Wikipedia.

<sup>4</sup> Deep neural networks are special models employing advanced analytics. They are force-fed large amounts of data that trains the model so the model can be used to classify future examples of similar data presented to it. They're sometimes referred to as "deep learning" or "deep machine learning" and come in many variations (such as convolutional and recurrent) (see ["Smart Machines See Major Breakthroughs After Decades of Failure"](#) ).

<sup>5</sup> ["Digital Transformation for Telecom Operators: Adapting to a Customer-Centric, Mobile-First World."](#) Deloitte.

<sup>6</sup> ["Internet Trends 2016 — Code Conference."](#) KPCB.

<sup>7</sup> Virtual personal assistants (VPAs) and virtual customer assistants (VCAs) are applications that exploit chatbots with extended response repertoires often rooted in machine learning and linguistic inferences drawn from knowledge graphs. VPAs perform some of the functions of a human assistant. VCAs acts on behalf of a company to simulate a conversation to deliver information and/or take action on behalf of a customer to perform transactions.

<sup>8</sup> Some claims are real, some exaggerated. Exercise due caution.

<sup>9</sup> See ["Entering the Smart-Machine Age," "Hype Cycle for Smart Machines, 2016," "Manufacturing Smart Machines Will Offer Major Opportunities, Cause Cultural Disruption and Radically Change Manufacturing Operations," "Smart Machines Will Be the Catalyst for One of the Most Disruptive Eras in Retail" and "Where Banks Can Use Smart Machines."](#)

<sup>10</sup> There are exceptions such as [Rokid](#), which leverages the Alibaba AI platform for learning services and the exceptions will grow in number and visibility over time.

<sup>11</sup> Definitions derived from the ["Hype Cycle for Smart Machines, 2016"](#) :

- Bots are microservices or apps that can operate on other entities (bots, apps, applications or services) in response to event triggers (state changes in back-end applications or databases) or user requests (increasingly, to occur via conversational UI). They call these entities by using an API or by emulating a user, an app or other entity.
- Chatbots are bots enhanced with a conversational user interface (CUI) that gives users the ability to interact with applications in a manner somewhat similar to human-to-human communication. In many cases, this interaction will be via text instead of voice. Voice interaction is not suitable to all use cases. Neither is text.
- Conversational UI (CUI) is a high-level design model in which user and machine interactions primarily occur in the user's spoken or written natural language. Typically informal and bidirectional, these interactions range from simple utterances (such as "Stop," "OK" or "What time is it?" "12:24") through to highly complex interactions (such as collecting oral testimony from crime witnesses) and highly complex results (such as creating an abstract image for the user). As design models, CUI depends on implementation via applications and related services.

<sup>12</sup> While CUI is a defining characteristic of bots called "chatbots," they are not always visible to users. They can, for example, be invoked by other bots to provide a particular service and return a result without ever showing their CUI to the user.

<sup>13</sup> E. M. Rogers. "Diffusions of Innovation." Free Press. 2003

<sup>14</sup> See, for example, [Clayton Christensen's extensive body of work](#), beginning with "The Innovator's Dilemma."

<sup>15</sup> See "[Invisible Hand Theory](#)." Google.

<sup>16</sup> For a list of the key attributes of natural-language dialogue systems, see "[Natural Dialog Systems](#)." Wikipedia.

<sup>17</sup> "[What Is Alexa Skills Kit?](#)" Amazon Developer.

<sup>18</sup> "[What Would Alexa Do?](#)" LinkedIn.

<sup>19</sup> "[Facebook Messenger Chatbots — A Disappointing Google Alternative](#)." Financial Times.

<sup>20</sup> It's fine for a developer to work on trying to endow technology with human-like attributes and capabilities but it's a mistake for buyers and others to assume that the technology is really human-like. It's just an illusion. Sometimes a very valuable illusion.

<sup>21</sup> See "[AI Winter](#)." Wikipedia.

<sup>22</sup> "[Bots on the Ground](#)." Washington Post. Also note the research on emotional robot avatars (such as Kismet) in the same article.

<sup>23</sup> See "[Closed Platform](#)." Wikipedia.

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